

**PERLESTA NAPACOLA, A NEW SPECIES IN THE  
PERLESTA FRISONI SPECIES GROUP  
(PLECOPTERA: PERLIDAE)<sup>1</sup>**

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**ABSTRACT:** *Perlesta napacola*, a new species of nearctic stonefly (Plecoptera: Perlidae), is described from a single location in eastern Illinois. This species is most closely related to those in the *Perlesta frisoni* species group, the male members of which exhibit patches of sensilla basiconica on the tenth tergite and an aedeagus without a caecum. This group at present includes *P. etnier*, *P. frisoni*, *P. nelsoni*, and *P. teaysia*. It differs from its group members by the combination of a spineless paraproct, subgenital plate with rounded lobes and U-shaped notch, and in having a sessile egg collar and shallow follicular cell impressions. The new species was found in a springbrook draining a relict beech and maple forest in a ravine in eastern Illinois. A key to the group is provided.

Species of the Nearctic stonefly genus *Perlesta* (Perlidae) are largely limited to eastern North America and are most prevalent in warm water streams where they are occasionally the dominant, and at times the only, summer emerging stonefly. Due to Stark's (1989) revision which included 12 species, and subsequent discoveries of new ones, it is now the most speciose perlid genus in North America. In the past decade Poulton and Stewart (1991), Kirchner and Kondratieff (1997), Stark and Rhodes (1997), DeWalt et al. (1998), Kondratieff and Baumann (1999), and Kondratieff and Kirchner (2002) described six new species. Currently, 18 species of *Perlesta* are recognized (see Stark's list at [www.mc.edu/campus/users/stark/](http://www.mc.edu/campus/users/stark/)).

The males of three *Perlesta* species exhibit well-defined patches of sensilla basiconica on the tenth abdominal tergite and the aedeagus lacks a caecum (Stark 1989, Kirchner and Kondratieff 1997). This *Perlesta frisoni* species group is currently composed of *P. etnier* Kondratieff and Kirchner, *P. frisoni* Banks, *P. nelsoni* Stark, and *P. teaysia* Kirchner and Kondratieff. A new species, which shares these characters, has recently been discovered from specimens in the Vermilion River drainage of eastern Illinois. Provided here are descriptions of all life stages, a comparison to other group members, and a description of the unique habitat of this new species.

The Holotype is deposited in the insect collection at the Illinois Natural History Survey, Champaign, Illinois (INHS). Paratypes were deposited in the INHS; in the C. P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado; and in the Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah.

<sup>1</sup> Received October 19, 2001. Accepted November 24, 2001.

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*Perlesta napacola* DeWalt, NEW SPECIES

(Figs. 1-7)

**Male.**—Forewing length 8.1 mm. Body is light colored in life, chiefly yellow, with light brown patches on the nota and abdomen; background color pales in alcohol. Head with black quadrate patch over ocellar region, with a small caudal facing triangle anterior to the patch (Fig. 1). Antennae bicolored, scape and pedicel light brown, next 7 segments pale, remainder dark brown. Pronotum light brown with light rugosities framing a median longitudinal brown band. Meso- and metanota light brown to amber. Wings light amber, costal margin of forewings pale throughout length, veins darker than membrane. Femora and tibia with dorsal brown band running their length. Abdomen pale with long, pale, erect hairs in sublateral rows on terga. Tergum 10 with two slightly elevated patches of approximately 20 sensilla basiconica each, separated by a narrow, spineless band (Fig. 2). Paraprocts moderately long, pointed tips often crossed and without a subterminal spine (Fig. 2 and 3). Aedeagal tube and sac long and slender without a caecum; dorsal and lateral sclerite patches long and narrow (Fig. 4).

**Female.**—Forewing length 10.6 mm. Color similar to male. Antennae grading basally from pale yellow to dark brown. Subgenital plate notch U-shaped, outer lobes rounded and lower than inner (Fig. 5).

**Egg.**—Oblong, pointed at one pole (Fig. 7A), length  $465.5 \pm 7.0$   $\mu$ m (mean  $\pm$  standard error,  $n = 4$ ), width  $316.8 \pm 7.0$   $\mu$ m; collar absent; chorion with mesal band of shallow pits connected by hexagonal follicular cell impressions (Fig. 7B), these grading to a smooth surface at poles; pits containing secretory products (7C, 7D); micropyles near interface between smooth posterior pole and mesal pitted band (7A).

**Nymph.**—Body length 7.1–8.0 mm. General color yellow to light brown; appressed brown clothing hairs densely cover body. Head with dark brown, M-shaped, transverse mask between lateral and anterior ocelli, anteriorly delimited by a pale M-shaped band with darker pigment anteriorly; occipital setal row complete; area posterior to lateral ocelli pale (Fig. 6); antennae unicolorous and light. Pronotum pigmented, pale oval areas amidst a dark background, anterior and posterior margins dark, lateral margins pale. Meso- and metanota with similar arching pigment patterns. Abdomen unicolorous light brown, without heavy intercalary setae.

**Types.**—Holotype male, Illinois: Vermilion County; unnamed tributary of Vermilion River, in Russell M. Duffin State Nature Preserve in Forest Glen County Forest Preserve; 7 km SE Westville; 40.0126 N latitude, -87.5525 W longitude; collected 19 June 2001 as nymph, reared 21 June, R. E. DeWalt. Given INHS Plecoptera #19197. Paratypes: same data as holotype except, 4 August 1977, D. W. Webb, 5 males, 5 females, #5063; same as holotype except, 6 July 2000, 3 females, #19196; same as holotype except, 3 males, 6 females, 4 nymphs, #19190; same data as holotype except, 1 male and 1 female, #19195, deaccessioned and sent as gift to C. P. Gillette Museum of Arthropod Diversity.

**Diagnosis.**—The adult male of *P. napacola* appears most similar to that of *P. etnier*, *P. frisoni*, *P. nelsoni*, and *P. teaysia* which also exhibit the well defined patches of sensilla basiconica of tergum 10 and lack a caecum on the aedeagus (Kirchner and Kondratieff 1997, Stark 1989). The new species lacks a subterminal spine on the paraproct, a trait shared with *P. teaysia* (Kirchner and Kondratieff 1997), while *P. etnier*, *P. frisoni*, and *P. nelsoni* males have a prominent spine (Stark 1989). Pale coloration of adults is common to group members, with the exception of *P. etnier* which is dark (Kondratieff and Kirchner 2002). Females of *P. napacola*, *P. nelsoni*, and *P. teaysia* share similar rounded subgenital plate lobes with U-shaped notches, while *P. frisoni* females have angular subgenital plate lobes with a V-shaped notch. *Perlesta etnier* females have rounded lobes with a small V-shaped notch (Kondratieff

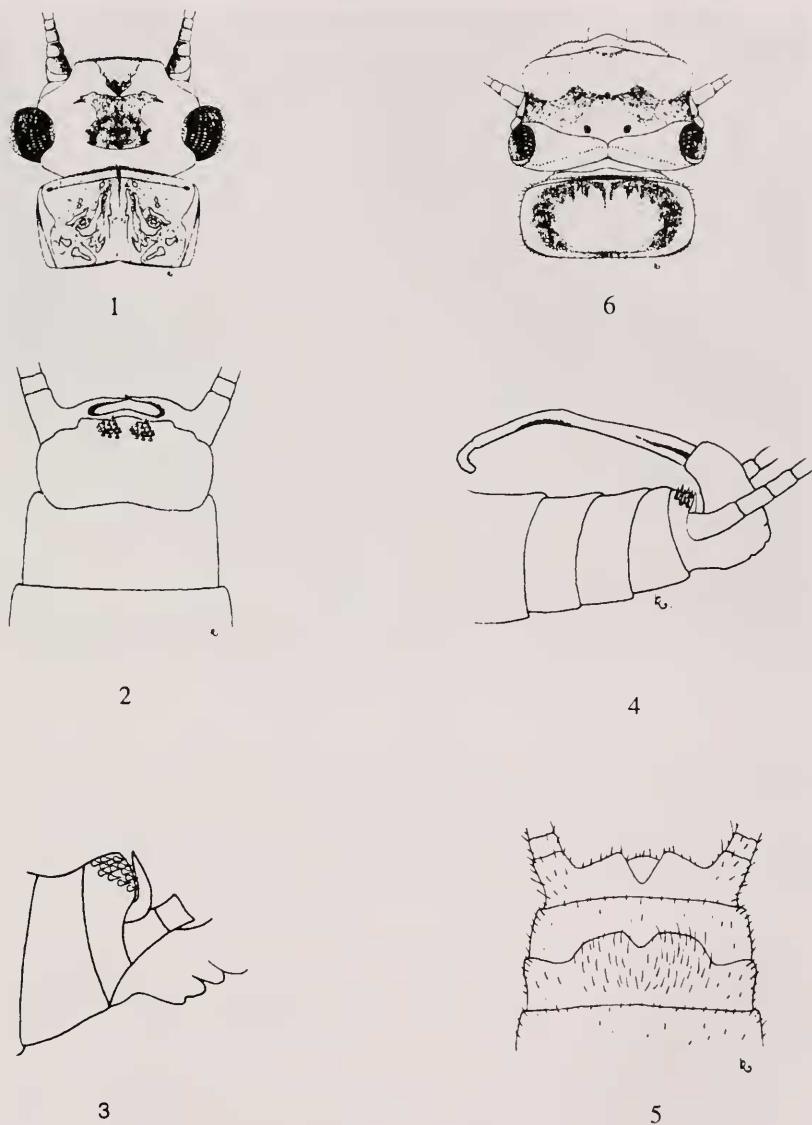


Fig. 1-6. *Perlesta napacola*. 1, Adult male head and pronotum. 2, Male 8-10 abdominal tergites with sensilla basiconica and dorsal view of paraprocts. 3, Lateral view of paraproct. 4, Aedeagal sac and tube, lateral view. 5, Female 8-10 abdominal sternites, subgenital plate lobes and notch. 6, Nymph head and pronotum.

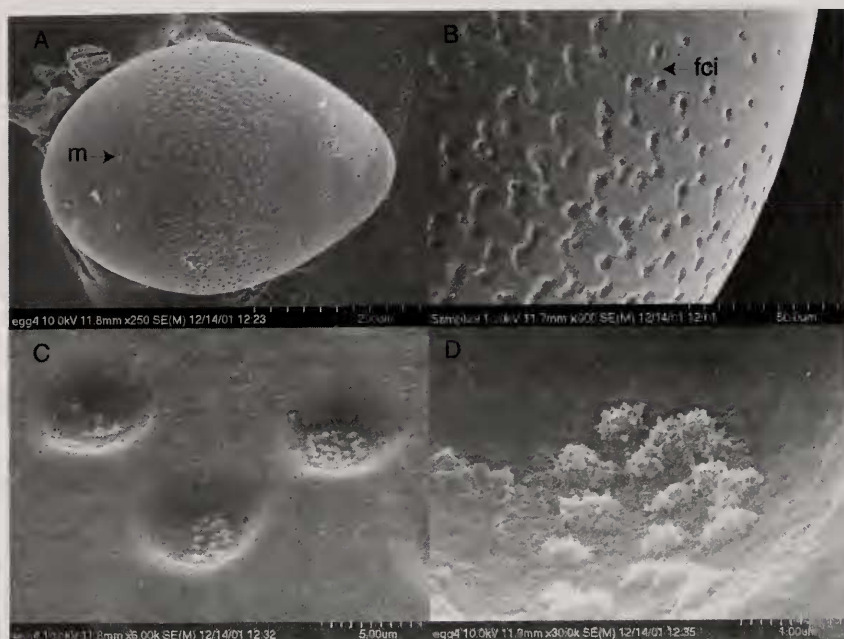


Fig. 7A-D. *Perlesta napacola* egg: A. Whole egg and mesal pitted band at 250X, B. Mesal pits and follicular cell impressions at 900X, C. Pits and secretions, 6000X, D. Single pit and secretions 30,000X. fci=follicular cell impressions, m=micropyle.

and Kirchner 2002). Eggs of *P. napacola*, *P. etnier* (Kondratieff and Kirchner 2002), and *P. frisoni* lack a stalked collar, while *P. nelsoni* and *P. teaysi* (Stark 1989, Kirchner and Kondratieff 1997) have a well-developed, stalked collar. *Perlesta napacola* eggs also exhibit hexagonal follicular cell impressions with a medial band of pits. *Perlesta etnier* and *P. frisoni* have a mesal transverse band of pits (Stark 1989, Kondratieff and Kirchner 2002).

**Etymology.**—The specific epithet, *napacola*, derives from the Greek for a wooded glen or ravine, “nape”, and the Latin “cola” for dweller (Brown 1956). The prefix refers to the type of habitat in which this species occurs. A suitable common name for this stonefly, in keeping with the use of “Stone” for perlid stoneflies (Stark et al. 1998), is Glen Stone.

**Comments.**—This new species will key to couplet 3 in Stark (1989). Modified couplets to separate *P. napacola* from group members follows, but currently there are no suitable characters that permit separation of *P. napacola* and *P. teaysia* males. It is imperative to utilize females with mature eggs to ensure correct identification. It is not known if *P. napacola* and *P. teaysia* are sympatric.

### Key to Modified Couplets

3. Paraprocts with subterminal spine; subgenital plate lobes angular or rounded, notch V- or U-shaped; egg collar stalked or not ..... 4
- Paraproct without a spine; subgenital plate lobes rounded, notch U-shaped; egg collar stalked or not ..... 5
4. T10 sensilla basiconica arranged in a pair of elevated, dense patches; paraprocts short, stout, bearing mesal spine close to tip; subgenital plate outline triangular, notch V-shaped; egg collar not stalked ..... *P. frisoni*
- T10 sensilla basiconica sparse but in a single, low patch; paraprocts slender with mesal spine well removed from tip; subgenital plate outline round, notch V- or U-shaped; egg with or without a narrow, stalked collar ..... 6
5. Egg collar stalked; distributed near western Virginia ..... *P. teaysia*
- Egg collar sessile (Fig. 7); distributed near eastern Illinois ..... *P. napacola*
6. Wing membrane, veins, and body pale yellow; subgenital plate with U-shaped notch; egg collar stalked ..... *P. nelsoni*
- Wing membrane, veins, and body dark brown to black; subgenital plate with shallow V-shaped notch; egg collar sessile ..... *P. etnier*

This species was reported as *P. nr. teaysia* (DeWalt et al. 2001), one of eight species in the genus listed for Illinois. Its population resides in a brook draining a relict beech and maple forest in mesic ravines leading into the Vermilion River, a tributary of the Wabash River. It has not been collected at other sites, but should eventually be located in other such remnants along the Indiana border and further east. Little of this habitat remains in Illinois.

Late instar nymphs were not easily collected due to their low density and specificity of habitat. They were least dense in riffles, but increased in abundance where a thin covering of leaves accumulated over fine sand in quiet water. Other taxa inhabiting the brook included the stoneflies *Amphinemura delosa* (Ricker), *Haploperla brevis* (Banks), *Leuctra tenuis* (Pictet), and *Soyedina vallicularia* (Wu) and the caddisflies *Cheumatopsyche oxa* Ross, *Diplectrona modesta* Banks, *Lepidostoma* spp., and *Neophylax concinnus* MacLachlan. These associated taxa are sensitive to organic pollution (Hilsenhoff 1987), suggesting that this particular *Perlesta* is also sensitive. Its absence from other lotic systems nearby supports this contention.

#### ACKNOWLEDGMENTS

I am indebted to K. Secviar for providing artwork, to C. Warwick for aid with digitizing images, and to R. Rakitov for help with SEM photomicrographs of eggs. INHS entomologists C. Favret and D. J. Voegtlin provided constructive comments on an earlier draft of this manuscript. This work was partially funded by the Illinois Department of Natural Resources Critical Trends Assessment Program, by a Statewide Biosurvey contract from the Illinois Department of Transportation, and by a National Science Foundation collection computerization grant DBI-9876756. The views expressed here do not necessarily coincide with those of the above sponsors.

#### LITERATURE CITED

- Brown, R. W. 1956. Composition of Scientific Words. Reese Press, Baltimore, MD. 882 pp.
- DeWalt, R. E., D. W. Webb, and T. N. Kompare. 2001. The *Perlesta placida* (Plecoptera: Perlidae) complex in Illinois, new state records, distributions, and an identification key. Proc. Entomol. Soc. Wash. 103: 207-216.

- DeWalt, R. E., B. P. Stark, and M. A. Harris.** 1998. *Perlesta golconda* (Plecoptera: Perlidae), a new stonefly species from Illinois. *Entomol. News* 109: 315-317.
- Hilsenhoff, W. L.** 1987. An improved biotic index of organic stream pollution. *Great Lakes Entomol.* 20: 31-39.
- Kirchner, R. F, and B. C. Kondratieff.** 1997. A new species of nearctic *Perlesta* (Plecoptera: Perlidae) from Virginia. *Proc. Entomol. Soc. Wash.* 99: 290-293.
- Kondratieff, B. C., and R. W. Baumann.** 1999. Studies on stoneflies of North Dakota with description of a new *Perlesta* species (Plecoptera: Perlidae). *Proc. Entomol. Soc. Wash.* 101: 325-331.
- Kondratieff, B. C. and R. F. Kirchner.** 2002. *Perlesta etnieri* (Plecoptera: Perlidae), A new species of stonefly from Tennessee. *Proc. Entomol. Soc. Wash.* 104: 51-55.
- Poulton, B. C., and K. W. Stewart.** 1991. The stoneflies of the Ozark and Ouachita Mountains (Plecoptera). *Mem. Am. Entomol. Soc.* 38: 1-116.
- Stark, B. P.** 1989. *Perlesta placida* (Hagen), an eastern nearctic species complex (Plecoptera: Perlidae). *Entomol. Scand.* 20: 263-286.
- Stark, B. P.** 1997. *Perlesta xube*, a new species of stonefly from Nebraska (Plecoptera: Perlidae). *Entomol. News* 108: 92-96.
- Stark, B. P., K. W. Stewart, S. W. Szczytko, and R. W. Baumann.** 1998. Common names of stoneflies (Plecoptera) from the United States and Canada. *Ohio Biol. Surv. Notes* 1: 1-18.